Algebra III Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cost, Profit and Revenue Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

HW Period\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Day One

1. *Cost function.* The management of a company that manufactures surfboards has fixed costs (at 0 output) of $200 a day and total costs of $3,800 per day at a daily output of 20 boards.
   1. Assuming the total cost per day, *C(x)*, is linearly related to the total output per day, *x*, write an equation for the cost function.
   2. What are the total costs for an output of 12 boards per day?
   3. Graph the cost function for .
2. *Price-demand function*. A manufacturing company is interested in introducing a new power mower. Its market research department gave the management the price-demand forecast listed in the table below.

|  |  |
| --- | --- |
| **Demand *x*** | **Wholesale Price *p(x)*** |
| 0 | 200 |
| 2,400 | 160 |
| 4,800 | 120 |
| 7,800 | 70 |

* 1. Plot these points, letting *P(x)* represent the price at which *x* number of mowers can be sold (demand). Label the horizontal axis *x*.
  2. Note that the points in part a lie along a straight line. Find an equation for the price-demand function.
  3. What would be the price for a demand of 3,000 units?
  4. Write a brief verbal interpretation of the slope of the line found in part b.

Day Two

1. *Cost function.* Repeat problem 1 if the company has fixed costs of $300 per day and total costs per day at an output of 20 boards of $5,100.
2. *Depreciation.* Office equipment was purchased for $20,000 and is assumed to have a scrap value of $2,000 after 10 years. If its value is depreciated linearly (for tax purposes) from $20,000 to $2,000:
   1. Find the linear equation that relates value (*V)* in dollars to time *(t)* in years.
   2. What would be the value of the equipment after 6 years?
   3. Graph the equation for .

Day Three

1. *Revenue.* The marketing research department for a company that manufactures and sells memory chips for microcomputers established the following price-demand and revenue functions:

 price-demand function

 revenue function

where *p(x)* is the wholesale price in dollars at which *x* million chips can be sold, and *R(x)* is in millions of dollars. Both functions have domain .

* 1. Graph the revenue function in your calculator, then sketch it **on graph paper.**
  2. Find the output (to the nearest thousand chips) that will produce the maximum revenue. What is the maximum revenue to the nearest thousand dollars?
  3. What is the wholesale price per chip (to the nearest dollar) that produces the maximum revenue?

1. *Break-even analysis.* Use the revenue function from problem 5, , and the cost function , where *x* is in millions of chips, and *R(x)* and *C(x)* are in millions of dollars. Both functions have domain .
   1. Graph both functions in the same viewing window and sketch **on graph paper**.
   2. Find the break-even points (intersection) to the nearest thousand chips.
   3. For what outputs will a loss occur? A profit?
2. *Profit-loss analysis.* Use the revenue function and cost functions from problem 6.
   1. Form a profit function P, and graph R, C, and P in the same viewing window and sketch **on graph paper**.
   2. Discuss the relationship between the intersection points of the graph of R and C and the x-intercepts of P.
   3. Find the x-intercepts of P algebraically to the nearest thousand chips. Find the break-even points to the nearest thousand chips.
   4. Solve part d, using your calculator.
   5. Refer to the graph drawn in part a. Does the maximum profit appear to occur at the same output level as the maximum revenue? Are the maximum profit land the maximum revenue equal? Explain.
   6. Verify your conclusion using your calculator.

Day Four

1. *Revenue.* The marketing research department for a company that manufactures and sells Notebook computers established the following price-demand and revenue functions:

 price-demand function

 revenue function

where *p(x)* is the wholesale price in dollars at which *x* thousand computers can be sold, and *R(x)* is in thousands of dollars. Both functions have domain .

* 1. Graph the revenue function in your calculator, then sketch it **on graph paper.**
  2. Find the output (to the nearest hundred computers) that will produce the maximum revenue. What is the maximum revenue to the nearest thousand dollars?
  3. What is the wholesale price per computer (to the nearest dollar) that produces the maximum revenue?

1. *Break-even analysis.*  Use the revenue function from problem 8, , and the cost function, .
   1. Graph both functions in the same viewing window and sketch **on graph paper**.
   2. Find the break-even points (intersection) to the nearest thousand chips.
   3. For what outputs will a loss occur? A profit?
2. *Profit-loss analysis.* Use the revenue function and cost functions from problem 9.
   1. Form a profit function P, and graph R, C, and P in the same viewing window and sketch **on graph paper**.
   2. Discuss the relationship between the intersection points of the graph of R and C and the x-intercepts of P.
   3. Find the x-intercepts of P algebraically to the nearest thousand chips. Find the break-even points to the nearest thousand chips.
   4. Solve part d, using your calculator.
   5. Refer to the graph drawn in part a. Does the maximum profit appear to occur at the same output level as the maximum revenue? Are the maximum profit land the maximum revenue equal? Explain.
   6. Verify your conclusion using your calculator.